From left: Lake Soil & Water Conservation District Manager Dan Schutte visits adjoining properties owned by brothers Larry Ronning and Brad Ronning on July 6 outside Two Harbors. The Ronnings are part of a Clean Water Fund pilot project that will reset pockets of forest to pre-logging days. The result, with an understory that reduces erosion, will benefit water quality. **Below:** *Spruce budworm larvae feed on needles in late summer and attack buds in spring.* **Photo Credits:** Ann Wessel, BWSR

How a spruce budworm outbreak and a Lake SWCD pilot project could reset pockets of forest to pre-logging days, curb erosion, benefit trout habitat and clean up a municipal water supply, resulting in a …

North Shore forest

TRANSFORMATION

By Ann Wessel

Minnesota Board of Water and Soil Resources

TWO HARBORS – Loggers. Fires. Deer.

All three swept through Lake County, transforming the mature white pine forest of the 1800s into thick balsam stands. Now the North Shore forest is being altered again – this time by tiny invaders that descend from balsam and spruce branches on slender threads.

The spruce budworm, a native pest in its fifth year of an infestation forecast to last through 2022, is decimating the balsams and, to a lesser extent, the spruce. Swaths of dead trees darken the landscape.

Nothing grows below. The forest is impenetrable. Devoid of wildlife.

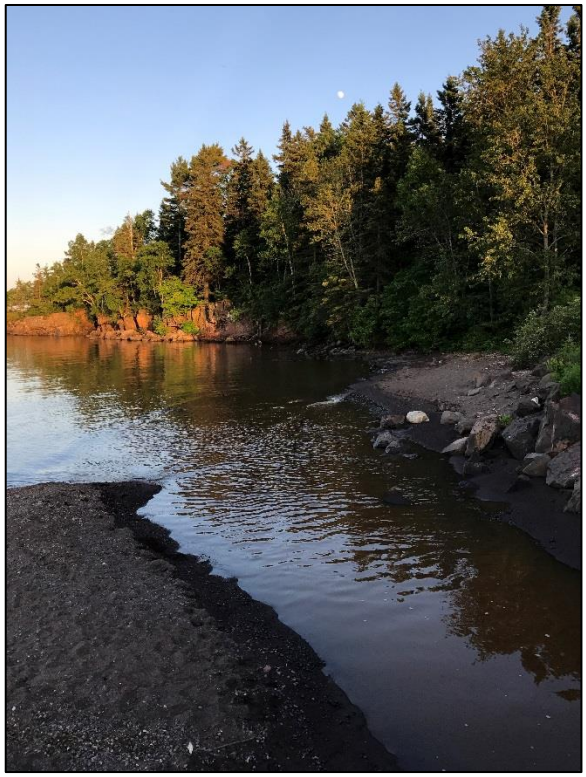
A tinderbox.

Lake Soil & Water Conservation District Manager Dan Schutte sees fire danger in the dense wall of dead and dying balsam. But the infestation is only one of the problems creeping up on the forest.

"There's a few issues that are moving slowly and at a large scale. One of those is a changing forest due to forest pests like spruce budworm," Schutte said. "We've got dying existing trees, we've got deer that are impacting the ability to grow new, desirable trees. And then we have climate change that is moving the entire needle of the system as far as forest health and function and species."

“The punchline is what happens on the land is reflected in the water.”

Dan Schutte, Lake Soil & Water Conservation District



Skunk Creek empties into Burlington Bay and Lake Superior at a point from which Two Harbors draws its drinking water. A Lake SWCD pilot project will protect that source.

A $160,440 Clean Water Fund pilot project underway in Lake County could reset pockets of forest to pre-logging days. If it succeeds, the project will curb erosion, clear up water and produce healthy seed trees that can jump-start regrowth after a fire, infestation or other disaster.

The grant is paying for a four-person Conservation Corps Minnesota & Iowa crew to clear dead trees, plant new ones, and remove invasive buckthorn and Japanese barberry.

BWSR

www.bwsr.state.mn.us

Twenty-one private landowners signed up. Landowners are responsible for 25 percent of the cost. In some cases, other programs helped pay for fencing or supplied free trees. Lake SWCD forester Tim Byrns made landowners aware of Natural Resources Conservation Service Environmental Quality Incentives Program cost-sharing grants for timber stand improvement – in some cases delivering applications to landowners’ homes.

The budget includes a $114,000 Clean Water Fund grant from the Minnesota Board of Water and Soil Resources, plus $46,440 in matching funds – including the landowners’ match.

“On these small patchworks we’re trying to remove what’s dead and dying, plant desirable tree species that are resilient in the face of climate change, and protect them from deer so they can grow,” Schutte said.

Project sites range in size from 2.5 acres to 30 acres. They total 300 acres of private forestland within the Knife River and Skunk Creek watersheds, including headwaters, streambanks and hayfields.

“The punchline is what happens on the land is reflected in the water,” Schutte said.

Allowing a more open-canopy, white-pine-dominated forest with soil-stabilizing ground cover and shrubs to take hold will keep an estimated 750 tons of sediment out of the Knife River every year. A designated trout stream, the Knife exceeds its turbidity goal by 90 percent every time it floods. The Knife and Skunk both empty into Lake Superior. Skunk Creek, impaired for turbidity and E. coli, contributes to Two Harbors’ municipal drinking water supply.

Schutte traced present-day problems to early logging days.

“When we took all those trees off, it really increased the runoff – both the quantity and the velocity,” Schutte said. “When all that water hit the channels, it eroded them quicker. We’re in a highly erodible soil up here, a lot of red-clay soils.”

Clear-cutting and the fires that followed opened the landscape to a succession forest. Caribou and moose moved out; deer moved in to browse on new-growth aspen and birch.

“We haven’t gotten rid of them,” Schutte said.

Deer favor white pine, white cedar and maple seedlings, so fencing usually is an expensive necessity.

Here is how the project is playing out on five properties.

A Conservation Corps Minnesota & Iowa crew cut, cleared and burned balsam decimated by a spruce budworm outbreak July 5 on 5 acres of Terry Gydesen's property outside Two Harbors. With a $114,000 Clean Water Fund grant from the Minnesota Board of Water and Soil Resources, Lake SWCD hired the crew. **Below:** *Gydesen, a Northeast Minneapolis-based documentary photographer, learned spruce budworms were killing her trees shortly after she bought the land at the Knife River headwaters.*

The Headwaters Retreat

One big rock and the 37 acres that came with it. That's how Terry Gydesen, 62, a Northeast Minneapolis-based documentary photographer, described the property she bought in July 2015 at the headwaters of the Knife River.

"This is the most perfect camping spot in the world. I still pinch myself," Gydesen said, sipping an iced coffee in the screen porch of her cabin.

"Within a month or two after I bought the place, all of a sudden I could see something was wrong with all the pine trees. A friend of mine thought it was army worms. It was in the throes of my father dying, his last weeks. Plus I was having a roof put on – there was all this other stuff going on. So I couldn't even deal with calling anybody."

Eventually, she learned spruce budworm was the problem.

When someone from the SWCD office offered assistance that February, she didn't hesitate.

For More Information

• Have a question about the grant? Contact Tim Byrns at tim.byrns@co.lake.mn.us or 218-834-8372.

On a steamy July afternoon, wood chips flew, chain saws whined and a pile of logs smoldered on 5 acres surrounding her cabin. A three-person Conservation Corps crew – short one person on this day – felled, cut, stacked and burned balsam.

Visiting the property for the first time, Schutte was struck by the open feel, noting large-leaved aster and other species that would flourish with more sunlight.

"It looks like a park," Schutte said.

Gydesen led the way past wildflowers and a small bed of foot-tall white pines she planned to replant later. A narrow path ended at the enormous glacial erratic that split the Knife River. A narrow stream at this point, the Knife flowed fast from its swampy source.

An easement prevents trees from being cleared within 100 feet of the river. Gydesen had set up a screen tent at the water's edge.

On the way back to the cabin, Schutte helped her calculate the height of one white pine that dwarfed everything around it. Rough estimate: 90 feet.
“At first I was really freaked out about losing all my pines but then – they’re dead anyhow, and they’re such a fire hazard. And now I can replant other things and just be a part of making an even more beautiful forest right here,” Gydesen said.

The Retired Hayfield

Nine-hundred and twenty trees.
Larry Johnson, 78, didn’t wait for the Conservation Corps. The trees arrived in early May, and he wanted to plant them before the ground dried out. By the time the crew arrived in early June, about three-quarters of the 920 red oak, bur oak, white pine, red maple, sugar maple, spruce and tamarack were in the ground.
The crew installed the protective fences and tubes that would keep deer at bay. Johnson went a step further and angled the weed-deterring tarps to funnel rainwater toward the roots. Now, rows of plastic tubes form concentric rings around 20 acres he’d hayed up until this summer. There’s just enough space between the outer ring of trees and the creek to run a brush hog. In the center, by early July waist-tall Timothy and oxeye daisies swayed in the breeze.

Debbie and Larry Johnson check on some of the 920 trees they planted this spring. The trees will ring hayfields cleared long ago. Bottom left: *A Conservation Corps Minnesota & Iowa crew installed the protective plastic tubes.* Bottom right: *Larry modified the weed-deterring tarps at the base of each tree so rainwater will funnel toward the roots. Forestry work completed here will improve water quality in the Knife River watershed.*

“There are a number of birds that nest in the field. When we cut hay in the summer, we run over a lot of those nests. So that’s why I just want to let it go natural and let the wildlife have a better opportunity to live and survive,” Larry said.
“The bees and the birds and the animals and the butterflies. It’s all for them, so they have a place to live,” Debbie, 77, interjected.
Establishing trees around the perimeter of hayfields cleared long ago will cut the amount of sediment entering the rivers – in the Johnson’s case, the Little West Branch of the Knife River.
The Johnsons, both retired elementary school teachers, bought 80 acres outside Two Harbors in 1962. Over the years, they planted trees – including a few apple and nut trees just for wildlife. Next, they want

to plant 100 yellow birch along a Knife River tributary. Debbie wants three more rows of trees around the fields, plus plots of corn and sunflowers.

They'd heard about the dead birch, the forest in trouble, the spruce budworm. Then they heard about the North Shore Forest Collaborative's efforts to maintain native trees along a 3.5-mile-wide, 140-mile-long strip of coastal forest that started with Lake County. Finally. They could do something about it.

"We learned that there was all this help for us. Every time we'd think of it, it's just so overwhelming for Larry and I," Debbie said.

Ordering 1,000 trees was a big commitment. The BWSR grant was like insurance – if the Johnsons couldn't plant the trees, someone else would.

"We just thought for the birds and the animals and everybody – we just like to make it for them. Then when we're gone the animals and the birds and the bees and the butterflies, they'll all live here in the flowers and the grasses. That's our purpose, you know? We just want it to turn out like that," Debbie said.

The Riparian Regeneration

A half-mile of stream.

With two of his four siblings, Brad Ronning owns property bordering a half-mile stretch of the Little Stewart River, a significant spawning habitat for steelhead. After a rain, Brad, a volunteer stream monitor, has seen visibility drop from 100 centimeters to 18 centimeters. Upstream, where the river flows more slowly through

Piles of dead trees await removal July 6 on Larry Ronning's land near Two Harbors. **Below:** *Brad Ronning will clear dead trees himself.*

Spruce Budworm Outbreak

SCOPE: About 130,500 acres, mostly in Lake County, some in St. Louis County.

CYCLE: Typically 8 years in the Arrowhead, where, since tracking began in the 1950s, there always has been an outbreak somewhere in the region. Canada sees fewer, but more severe and far-reaching outbreaks, usually every 30 years.

MORTALITY: Mid-outbreak mortality rates are 75 to 100 percent for balsam fir; 10 to 40 percent for mature white spruce.

ATTACK: Larvae feed on needles in late summer, over-winter in bark, and attack new-growth buds in spring. Damage continues as trees' ability to carry out photosynthesis is hurt, and trees expend energy growing new needles.

Sources: Brian Schwingle, Val Cervenka, Jessica Hartshorn, DNR forest health specialists

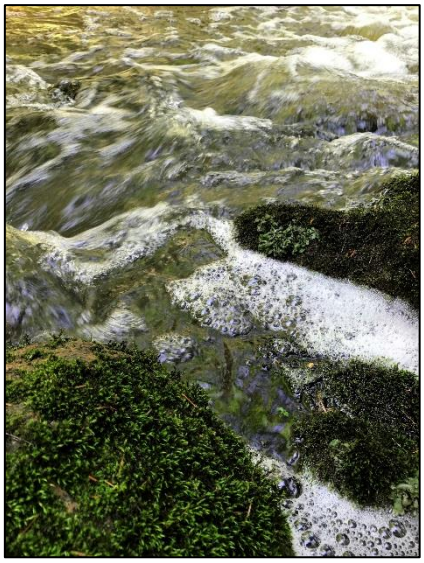
a series of beaver ponds, he's helped Trout Unlimited plant thousands of trees to improve habitat. On his land, the river drops more dramatically. The banks are steeper. Slumping. The water rushes. The riverbottom is bedrock.

Brad and his brother Larry had been planting trees on their adjoining properties for years before they signed up for the Lake SWCD pilot project.

Brad had planted 400 trees within 10 acres of his 25-acre site, starting with spots that washed out in the 2012 flood. On the 2.5 acres enrolled in the pilot, he's already cleared hundreds of balsams, and plans to plant more as he can afford to cage the trees.

"There's nothing that I'd rather do than hang out in the woods," Brad said. "I'll not see all those white pine and cedar, but someone's going to be awful happy I did it someday."

A recently retired electrician, Brad, 62, bought a chain saw and snowmobile so he could clear the trees himself. Larry opted to hire a contractor, whose work left large piles of rust-colored balsam and spruce branches and trunks awaiting disposal.



Larry Ronning walked through 6 acres of his property July 6 where a contractor cut spruce and balsam trees killed in a spruce budworm outbreak.
Left: *The Little Stewart River runs through the Ronnings' property.*

"We want to accelerate where the forest is at and get it to a place where it's going to be resilient in the face of climate change, we're going to have a diversity of trees on the landscape that have a chance to make it to adulthood."
– Dan Schutte, Lake Soil & Water Conservation District

Maples are becoming established in the upland forest within the 6-acre project site. Natural white pine regeneration is the goal along the river, where trees cannot be cut. Springy white pine seedlings grow amid waist-high ferns, large-leaved asters, dew berries and other plants covering the newly cleared forest.

A retired classic wooden boat builder, residential contractor, and U.S. Forest Service seasonal reforestation technician, Larry, 65, has scaled back to landlord for 17 apartments. He built the road to his property in 1979, lived off the grid for 14 years, relying on solar power.

Contractors like him, he said, probably contributed to erosion by clearing the land.

The reforestation he's doing now will directly benefit the stream. Like Brad, he'd already been planting trees on his 30-acre property.

"You'll see little pockets of trees that I've put in," Larry said, motioning across a wet sedge meadow to prior red pine plantings and scattered white pines encased in wooden snow fencing.

On the way to Brad's adjoining property, Larry stopped at a spot that clearly illustrated the problem. Here, far above the stream, the 2012 flood gouged out a section of a hillside. Where the red clay slumped, it dropped trees several feet down the slope. With every hard rain, more of the hillside sluffs off.

"After that flood, it changed the course of the river," Brad said. "Small changes. But there's just so much sediment."

A before-and-after view of forest choked by balsam and spruce trees, left, and one cleared of dead and dying balsam and spruce is visible July 6 off the road where Jamie and Penny Juenemann are part of a Lake SWCD pilot project funded by a Clean Water Fund grant. **Below:** *Penny and Jamie Juenemann's property borders the Little Stewart River, a trout stream where steelhead spawn.*

The Trout Stream

Browsing deer are among the forces that shape the forest in Lake County. Planted trees must be protected.

Big trout.

Jamie Juenemann grew up catching 8- and 9-pound steelhead rainbow trout downstream in the Little Stewart River, where 40 percent of the steelhead in all of Lake Superior go to spawn. The topography makes most rivers impassible within the first mile upstream of Lake Superior. This one has close to 10 miles of habitat.

It's a steep scramble to the chocolaty water that rushes around moss-covered rocks. Juenemann points upstream to a dead spruce snapped in half over a riffle, opening a sunny spot that will warm the habitat of cold-water-loving trout.

"This little stream is quite important in the bigger picture because most streams on the North Shore are blocked by barriers within the first mile or half-mile. This one provides about 10 miles of stream channel for trout to thrive in," Juenemann said.

The Little Stewart originates in swamps and seeps, which makes for cooler water. Still, this habitat could stand improving.

"You look at the stream bottom and it's nothing but shifting rocks and gravel and sand. It needs logs. It needs riffles. It needs all that to slow the flow, create the habitat for fish and invertebrates," Jamie said. "Here it's not so bad, but there's areas downstream where it's just bedrock."

Large submerged logs can create pools, deflect water, stabilize the stream. Fallen spruce, however, provide no such habitat benefits. Eventually, a hard rain will flush the spindly specimen overhanging the riffle downstream and into Lake Superior.

Jamie, 54, a Minnesota Department of Natural Resources conservation easement specialist, and his wife, Penny, 46, a science teacher, are protecting planted trees with 6-foot-tall fencing, attempting to re-establish a climax forest that once stood here. They, too, have planted more than 100 trees on their own.

Once dead balsam trees were cleared, Jamie and Penny Juenemann were left with a stand that consists mostly of stunted birch, quaking aspen and big-toothed aspen. They saved other shrub species, and aim to include a mix that will feed wildlife.

"(An) EQIP grant really gave us something systematic to work with, rather than haphazardly going through the woods," Juenemann said. "When you have trees scattered across the landscape in kind of undefined areas, you kind of lose track of them. Here, it's a defined area. … I think it's going to be easy to maintain and manage long-term."

As he walked, Jamie pointed out moss-covered stumps, remnants of white pines 2 to 3 feet in diameter harvested more than 100 years ago. He pointed out mounds and depressions, indicators of great white pines toppled by windstorms 4,000 to 5,000 years ago. The depressions mark where the tree was uprooted; the mound where dirt sifted from the roots.

"I'm amazed how many of these we see. I've got a pretty vivid imagination I can just picture what this area looked like," Jamie said.

The Juenemanns salvaged everything that wasn't balsam. Stunted successional forest species remained. Seventy-year-old birch. Spindly Juneberries. Blueberries, already eaten by deer.

They want to see a forest dominated by white pine, northern white cedar and yellow birch with a mix of paper birch, bigtooth aspen, basswood and maples. For pollinators, they'll plant shrubs including cranberry, Juneberry, chokecherry, pin cherry, downy arrowwood.

"For me, it's kind of tragic we're not able to see that forest regenerate on its own. We have to go in and go through great lengths to get white pine and Northern white cedar and yellow birth re-established here," Jamie said. "It's work to do what Mother Nature did on its own 150-plus years ago."

The Cabin Clearing

Wayne Kragseth grew up hunting on the Drummond Grade.

"There used to be a little shack. I spent a lot of time up here in the fall," Kragseth said, surveying the hilltop site that catches the Drummond Draft.

His great-aunt passed the 40-acre property on to Wayne's father, who added a few outbuildings. Kragseth recalled a sugarbush, stands of mature trees that grew before the balsams moved in and crowded everything out.

When Kragseth built a cabin a few years ago, he cleared the balsams from the site and down the hill to a pond. Fire danger remained a concern on the forested property.

On a July afternoon, he met the contractor who would run a machine

Wayne and Karen Kragseth took a break from gardening July 6 to talk about plans for the 15 acres of their property outside Two Harbors that was to be clear-cut as part of a Lake SWCD forestry pilot project that will reset pockets of land to pre-logging white pine forest.

that grinds up everything in its path and spreads the mulch – mulch in which seedlings will take root. For years, Kragseth had planted red pines and other trees, mostly along the driveway. This 15-acre project will open up the forest, make it possible for him and his wife, Karen, to continue snowshoeing. Once balsams die and fall, woods become nearly impassable. With every visit, Kragseth said he noticed more dead trees. Spruce budworm moths collected on a screened outdoor sitting area as Wayne and Karen talked about their plans to manage the damage. Wayne, 64, was a MRI technologist who worked out of an 18-wheel mobile unit based in Milaca. Karen, 64, was a registered nurse for St. Luke's Home Care in Duluth. Both recently retired. They live just outside Duluth; this is the spot where they often spend time with grandchildren. They'll work this season to clean up and burn the remaining brush.

When Wayne and Karen Kragseth had a cabin built on their Lake County property, they cleared the area around the site and down the hill to a pond. This summer, a contractor cleared stands of balsam that made the forest nearly impassable. **Right:** *Spruce budworm moths rest on the screen of an outdoor seating area.*

"I didn't know what to expect," Kragseth said by phone after the contractors finished three weeks' work. "It turned out what they do is not like you would do cutting it by hand. It's quite a drastic change. They can't be delicate. But it turned out remarkable."

Kragseth described the cleared area as containing big chunks of frayed trees. He's walked through it and driven a four-wheeler across it. The clearing revealed previously undetected white pines.

"The woods were so thick you couldn't walk to them (before)," Kragseth said.

The project will allow the Kragseths to continue using their land as they please. Improvements to the upland forest here will benefit the Knife River.

For Schutte, the best project-wide outcome would be a successful year with happy landowners who spread the word and build interest in forestry practices contributing to clean water. Gauging how well each practice works will require a test.

"The way you're going to know if it works is if there's a huge natural disaster and a huge forest fire comes through and the house probably isn't going to burn down. They're probably going to have intact seed trees. It seems to me a small dollar investment in a future safety button," Schutte said.

"At least we've got these islands of mature, healthy seed trees that aren't going to be burned by the fire because we got rid of the fuel. And they're going to start seeding, and the areas that they're seeding into are going to be able to accept the seed and regenerate things."

The Minnesota Board of Water and Soil Resources' mission is to improve and protect Minnesota's water and soil resources by working in partnership with local organizations and private landowners.